A High-Resolution Enhancer Atlas of the Developing Telencephalon.

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Public Summary:
This paper describes the first large scale identification of parts of the human chromosome that control gene expression in parts of the embryonic brain. This information can be used to facilitate basic research on stem cells that generate neurons, and to help identify causes of human disorders of brain development.

Scientific Abstract:
The mammalian telencephalon plays critical roles in cognition, motor function, and emotion. Though many of the genes required for its development have been identified, the distant-acting regulatory sequences orchestrating their in vivo expression are mostly unknown. Here, we describe a digital atlas of in vivo enhancers active in subregions of the developing telencephalon. We identified more than 4,600 candidate embryonic forebrain enhancers and studied the in vivo activity of 329 of these sequences in transgenic mouse embryos. We generated serial sets of histological brain sections for 145 reproducible forebrain enhancers, resulting in a publicly accessible web-based data collection comprising more than 32,000 sections. We also used epigenomic analysis of human and mouse cortex tissue to directly compare the genome-wide enhancer architecture in these species. These data provide a primary resource for investigating gene regulatory mechanisms of telencephalon development and enable studies of the role of distant-acting enhancers in neurodevelopmental disorders.

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